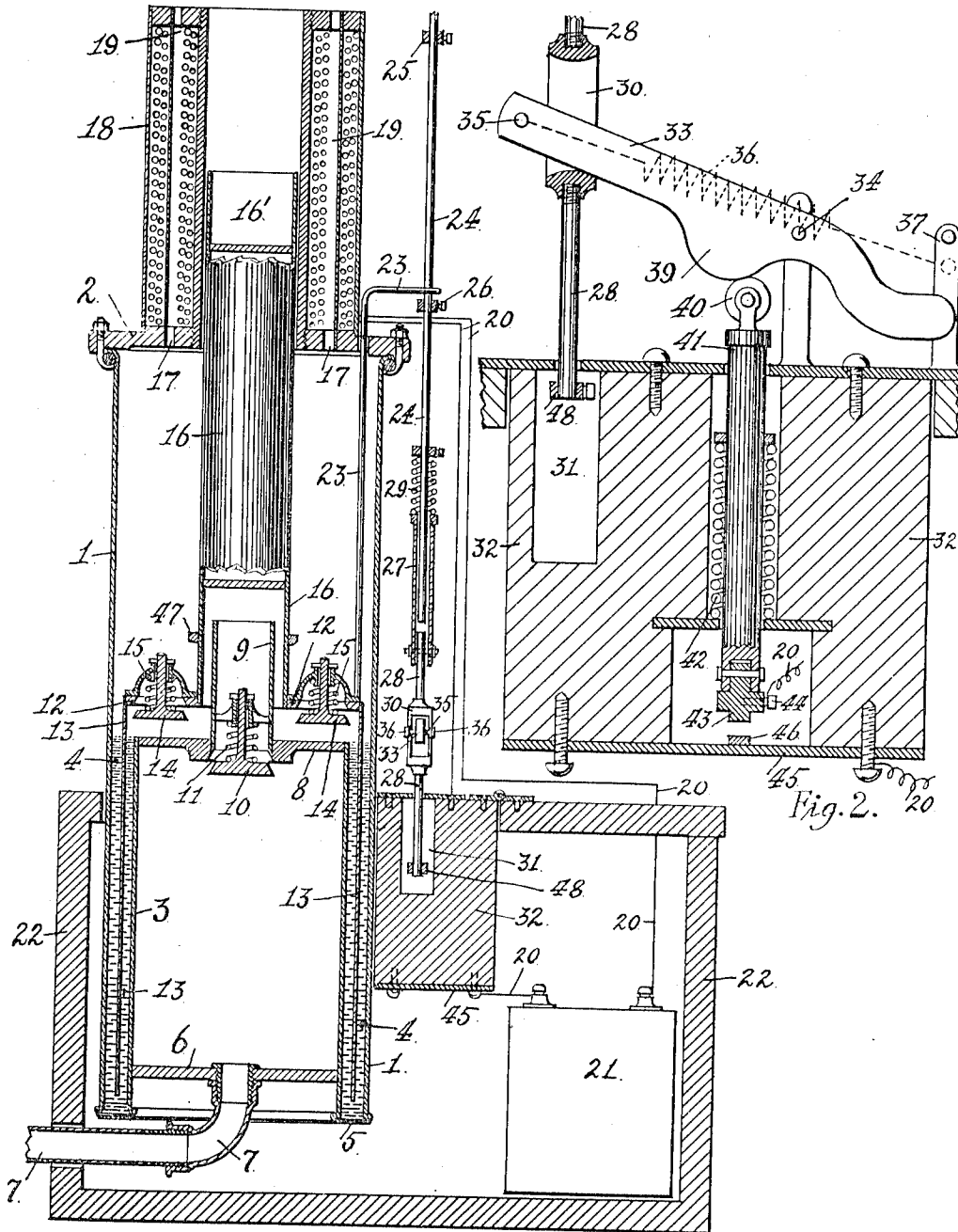


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ELECTRIC AIR COMPRESSOR.
APPLICATION FILED SEPT. 30, 1912.

1,064,103.

Patented June 10, 1913.



Witnesses.

C. S. Lemmer.
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Fig. 1.

Inventors.

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UNITED STATES PATENT OFFICE.

STEPHEN P. SMITH, OF BERKELEY, AND CHARLES W. KEIVER, OF OAKLAND,
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ELECTRIC AIR-COMPRESSOR.

1,064,103.

Specification of Letters Patent.

Patented June 10, 1913.

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To all whom it may concern:

Be it known that we, STEPHEN P. SMITH and CHARLES W. KEIVER, citizens of the United States, the said SMITH residing at Berkeley, in the county of Alameda and State of California, and the said KEIVER residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Electric Air-Compressors, of which the following is a specification.

Our invention relates to the class of air-compressors.

The object of our invention is to provide a simple and effective air-compressor adapted for use in supplying air to a carbureter in connection with a lighting system using carbureted air for illumination.

The nature of our invention and the manner of its use will hereinafter fully appear from the following description and by reference to the accompanying drawings, in which—

Figure 1 is a vertical section of our air-compressor. Fig. 2 is a side view, enlarged, of the operating connections of the electric switch in the circuit which operates the compressor.

1 is the pump barrel consisting of a shell closed at its top by a head 2. In the lower portion of the barrel and concentric with it is an inner shell 3, which is separated from the outer shell by a circumferential space, which contains the liquid-seal, indicated by 4, and which in practice is best formed by oil. This liquid-seal space is closed at its bottom by a cap 5 connecting the bases of the inner and outer shells, but said space is open at its upper end to the interior of the barrel 1. The base of the inner shell is closed by a foot-plate 6 from which issues the air-delivery pipe 7 leading to whatever destination may be intended. The top of the inner shell is closed by a head 8, from which rises a short pipe 9, in the base of which is formed a seat for a downward opening valve 10, controlled by a spring 11. The short pipe 9 serves as a guard to insure the valve against the liquid of the seal 4.

Within the upper portion of the outer shell or barrel 1 is the piston 12. This is a plate which moves freely and without any packing in the barrel. To the outer edge of this piston or plate 12 is secured the extension flange 13 which plays freely in the

liquid-seal 4, thereby forming the necessary packing or air tight joint for the piston. In the piston are the downward opening valves 14, controlled by springs 15. With the piston 12 is connected the rod 16. Air is admitted to the upper end of the barrel 1 by the holes 17 through the head 2.

Before continuing the description, it will be well at this point to describe the operation of the parts thus far set forth.

If the rod 16 be reciprocated, the air in the upper end of the barrel will on the up-stroke of the piston 12 pass through the valves 14, and upon the down-stroke of the piston this air, constrained by the liquid-seal 4, will be forced through the valve 10 into the inner shell 3 and thence through the delivery pipe 7. The enlargement of the inner shell as compared to the delivery pipe, while not essential, is, however, of advantage in giving a slight storage and cushion, sufficient for the relatively small pressures which this air-compressor is intended to pump against. It may be here again stated that it is intended for use as part of an apparatus for making illuminating gas by supplying air to a carbureter; and the volume supplied will be dependent upon the varying number of lights in use, by automatically controlling the speed of the pump operating mechanism. This now naturally leads to a description of the operating means.

18 is an electro-magnet of the solenoid type. It is mounted upon the head 2, and its only peculiarity is its formation with an air passage 19 leading from its top down to and communicating with the air holes 17 in the head 2. This air passing through the magnet will tend to cool it. The piston rod 16 is the armature of the solenoid 18 made in usual or suitable manner, and said rod is best formed with a chamber 16' in its upper end, in which weights may be placed in order to regulate the weight of the rod to the pressures desired.

20 are the wires of the electric circuit which may lead from any suitable source, here shown as from a battery 21 in a box 22 which, in the present illustration, serves also as a base support for the pump.

The electric energy is automatically controlled as follows:—23 is a bumper arm which is attached at its lower end to the piston 12. It passes up through the head

2 and its upper end is bent outward and made slidable upon the vertically movable rod 24, between an upper bumper 25 and a lower bumper 26 thereon. The lower end of the rod 24 is guided in a sleeve 27 secured to and rising from a yoke-rod 28, and a spring connection 29 is made between the rod 24 and the sleeve 27. The upper end of the yoke-rod 28 lies under the lower end of the rod 24 and is normally separated therefrom by a short distance. The yoke-rod 28 has a yoke 30, and the lower end of the rod plays in a socket 31 in an insulating block 32 carried by the top of the box 22. 33 is a lever pivoted at 34. One end of this lever enters the yoke 30 of the rod 28, and is adapted to be forced down and raised up initially by the extremities of said yoke. The end of the lever 33 carries a pin 35 from which extend springs 36 to a post 37. These springs are so arranged as to force and hold the lever up or down on each side of its central horizontal plane of movement. On the under side of the lever is a cam 39 which plays upon a ball or roll 40 in the top of a sliding post 41, socketed within the insulating block 32, and held normally up by a spring 42. The lower end of this post carries a contact 43 which forms one pole of a circuit breaker or switch, being adapted to receive the plug 44 of one of the circuit wires. The base of the block 32 is fitted with a metallic plate 45 on which is the opposing contact or pole 46. This plate 45 is included in the battery circuit as shown. 47 is a stop on the piston rod 16 to limit its up-stroke. 48 is a stop to limit the upward movement of the rod 28. The operation of these parts will now be understood.

When the piston 12 of the pump reaches its lower position, the bumper arm 23, by contact with the lower bumper 26, forces the rod 24 down, which rod by contact with the aligned rod 28 forces said rod down so that its yoke 30 bearing down on the lever 33 starts said lever down, this movement of the lever being continued and completed by the springs 36. As the lever 33 moves down its cam 39 forces the post 41 down until its pole 43 makes electrical contact with the opposite pole 46. The circuit is thus closed and the solenoid 18 being energized, draws up its armature or piston rod 16 and the up-stroke of the piston begins. This stroke continues to its end, when, the bumper arm 23 coming in contact with the upper bumper 25 of the slide rod 24 lifts said rod to its first position. The lifting of this rod, lifts the rod 28, the yoke 30 of which rising lifts the lever 33 and thus allows the post 41, under the influence of its spring 42, to withdraw its pole 43 from the fixed pole 46 thereby opening or breaking the electric circuit. Thereupon, the solenoid magnet being deenergized, the pis-

ton 12 under the weight of the armature rod 16 descends and accomplishes its down-stroke, at the completion of which a repetition of the operation is had. The weight of the piston rod or armature 16 may be increased, as before stated, by placing weights in the upper chamber 16' of said rod, and these weights may be regulated to suit the pressure desired. The spring connection 29 avoids undue shock in relative action of the two rods 24 and 28.

It will now be seen that according to the number of lights being used, the pump will automatically work faster or slower, for a greater number of lights will withdraw a greater volume of air through the carbureter, from the pump, and thus permit the more rapid gravity drop of the piston with consequent increase in the number of strokes, and vice-versa, a fewer number of lights by leaving the unneeded air in the pump will retard the drop of the piston and the strokes will be fewer.

We claim:—

1. In an air compressor, the combination of an outer shell or barrel having at its top an apertured head for the admission of air, an inner shell in the lower portion of the barrel and separated therefrom to leave a circumscribing space containing a liquid seal closed at the bottom, and open at the top to the interior of the barrel, said inner shell having an outlet from its base, and a downwardly opening valve in its top; a piston disposed for reciprocative movement in the upper portion of the barrel above the inner shell, said piston having downwardly opening valves; an extension flange secured to the piston and depending therefrom into and working within the liquid seal; a solenoid magnet carried by the head of the outer shell or barrel; an electric circuit to operate the magnet; a rod constituting the armature of said solenoid magnet and connected with the piston under the weight of which said piston effects its down-stroke, said rod having a chamber in its top for the reception of additional weights; and means operated by the piston for closing and opening the electric circuit for lifting the rod and releasing it to permit the down-stroke of the piston by gravity.

2. In an air compressor, the combination of an outer shell or barrel having at its top an apertured head for the admission of air, an inner shell in the lower portion of the barrel and separated therefrom to leave a circumscribing space containing a liquid seal closed at the bottom, and open at the top to the interior of the barrel, said inner shell having an outlet from its base, and a downwardly opening valve in its top; a piston disposed for reciprocative movement in the upper portion of the barrel above the inner shell, said piston having downwardly open-

ing valves; an extension flange secured to the piston and depending therefrom into and working within the liquid seal; a solenoid magnet carried by the head of the outer shell or barrel; an electric circuit to operate the magnet; a rod constituting the armature of said solenoid magnet and connected with the piston under the weight of which said piston effects its down-stroke; and means operated by the piston for closing and opening the electric circuit for lifting the rod and releasing it to permit the down-stroke of the piston by gravity.

3. In an air compressor, the combination of an outer shell or barrel having at its top an apertured head for the admission of air, an inner shell in the lower portion of the barrel and separated therefrom to leave a circumscribing space containing a liquid seal closed at the bottom, and open at the top to the interior of the barrel, said inner shell having an outlet from its base, and a downwardly opening valve in its top; a piston disposed for reciprocative movement in the upper portion of the barrel above the inner shell, said piston having downwardly opening valves; an extension flange secured to the piston and depending therefrom into and working within the liquid seal; a rod connected with the piston under the weight of which said piston effects its down-stroke; and electrically operated means for lifting the rod and releasing it to permit the down-stroke of the piston by gravity, comprising a solenoid magnet carried by the head of the other shell or barrel of which said magnet the piston rod forms the armature, an electric circuit for operating the magnet, a bumper arm secured to the piston and extending to the exterior of the outer shell or barrel, and an electric switch in said circuit operated by the movement of the piston bumper arm to close and open said circuit.

4. In an air compressor, the combination of an outer shell or barrel having at its top an apertured head for the admission of air, an inner shell in the lower portion of the barrel and separated therefrom to leave a circumscribing space containing a liquid seal closed at the bottom, and open at the top to the interior of the barrel, said inner shell having an outlet from its base, and a downwardly opening valve in its top; a piston disposed for reciprocative movement in the upper portion of the barrel above the inner shell, said piston having downwardly opening valves; an extension flange secured to the piston and depending therefrom into and working within the liquid seal; a rod connected with the piston under the weight of which said piston effects its down-stroke; and electrically operated means for lifting the rod and releasing it to permit the down-stroke of the piston by gravity, comprising a solenoid magnet of which the piston rod

forms the armature, said magnet having a longitudinal passage through it communicating with the apertures in the head of the barrel, an electric circuit for operating the magnet, and an electric switch in said circuit operated by the movement of the piston.

5. In an air compressor, the combination of an outer shell or barrel having at its top an apertured head for the admission of air, an inner shell in the lower portion of the barrel and separated therefrom to leave a circumscribing space containing a liquid seal closed at the bottom, and open at the top to the interior of the barrel, said inner shell having an outlet from its base, and a downwardly opening valve in its top; a piston disposed for reciprocative movement in the upper portion of the barrel above the inner shell, said piston having downwardly opening valves; an extension flange secured to the piston and depending therefrom into and working within the liquid seal; a rod connected with the piston under the weight of which said piston effects its down-stroke; and electrically operated means for lifting the rod and releasing it to permit the down-stroke of the piston by gravity, comprising a solenoid magnet of which the piston rod forms the armature, an electric circuit for operating the magnet, and an electric switch in said circuit operated by the movement of the piston, comprising poles, one of which is movable to and from the other, a bumper arm on the piston, a slidable rod with bumpers between which the bumper arm plays, and connections between said slidable rod and the movable pole of the switch.

6. In an air compressor, the combination of an outer shell or barrel having at its top an apertured head for the admission of air, an inner shell in the lower portion of the barrel and separated therefrom to leave a circumscribing space containing a liquid seal closed at the bottom, and open at the top to the interior of the barrel, said inner shell having an outlet from its base, and a downwardly opening valve in its top; a piston disposed for reciprocating movement in the upper portion of the barrel above the inner shell, said piston having downwardly opening valves; an extension flange secured to the piston and depending therefrom into and working within the liquid seal; a rod connected with the piston under the weight of which said piston effects its down-stroke; and electrically operated means for lifting the rod and releasing it to permit the down-stroke of the piston by gravity, comprising a solenoid magnet of which the piston rod forms the armature, an electric circuit for operating the magnet, and an electric switch in said circuit operated by the movement of the piston, comprising poles, one of which is movable to and from the other, a bumper arm on the piston, a slidable rod

with bumpers between which the bumper
arm plays, and connections between said
slidable rod and the movable pole of the
switch, including a second slidable rod op-
erated by the first slidable rod and having
a yoke, a pivoted spring controlled lever
operated by said yoke, said yoke having a
cam, and a spring controlled post operated
by the cam and carrying the movable pole.

In testimony whereof we have signed our
names to this specification in the presence of
two subscribing witnesses.

STEPHEN P. SMITH.
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Witnesses:

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S. CONSTINE.